EFFECT OF YOGIC PRACTICES AND WEIGHT TRAINING EXERCISES ON CARDIOVASCULAR ENDURANCE AND MOTOR FITNESS OF MALE COLLEGE STUDENTS OF SATARA DISTRICT: A COMPARATIVE STUDY

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INTRODUCTION

The human body evolved to be physically active. In other words, our bodies require physical activity to remain healthy. Throughout history, survival of the human species depended on hunting or gathering our food supplies, pursuits that demanded prolonged and often strenuous physical activity. The advent of mechanization and modern technology in the last few decades has resulted in the human race becoming less physically active than ever before – and we are paying for it with our health. Though the physical education classes during school days are trying to implement and establish positive lifestyle behaviors and improving fitness in children and adolescents however, the transition from childhood to adolescence is associated with decreased levels of physical activity and an increased prevalence of a sedentary lifestyle (Centers for disease control & prevention 2003; Nelson et al., 2006). Most adolescents fail to meet the recommended minimal levels of physical activity (Rosamond et al., 2007) necessary for optimizing physical development and body composition (Anderson et al., 1998), which is a major public health concern (Crespo & Arbesman 2003; Goran, Reynolds & Lindquist 1999). Most of the college students are only exposed to physical exercises during school-based physical education classes and majority of them do not participate in any organized physical exercise activities during non-school hours (Coleman, Heath & Alcala, 2004).

Nevertheless, earlier research studies have indicated that regular physical exercise is associated with a healthier, longer life (Lee, Paffenbarger & Hennekens 1997; Paffenbarger, Hyde, Wing & Hsieh 1986). However,

previous studies indicates that the level of physical activity declines from high school to college, and activity patterns in college populations are generally insufficient to improve health and fitness (Douglas *et al.*, 1997). The situation is similar worldwide in both developed and developing countries, with a large body of research evidence indicating declining levels of physical activity and physical fitness within all age brackets. Physical inactivity is widely recognized as a major risk factor for contributing towards development of chronic diseases (WHO 2002; Warburton, Nicol & Bredin 2006). Therefore, it is necessary that the habit of physical exercise should also be developed in college going students.

The importance of physical activity for the physical, mental and social health of youth is undisputed, and therefore it is critically important that efforts are made throughout the world to “reintroduce” physical activity into our youth. Although proper exercises contribute to fitness, which is the foundation of a beautiful youth, it not only provides a way to redeem oneself from a life of fast food, beer and indolence, but also makes one to have new look towards life and feel good. Various research studies have shown that mild to moderate exercises help to prevent heart attack, weight control, physical well being, and enhance creativity (Berlin & Colditz, 1990; Lauer *et al*., 1975; Paffenbarger *et al*., 1986; Pate & Shephard, 1989; Powell, *et al*., 1987).

In this context, it has been found that the conventional exercises (endurance exercises like walking, jogging, running, swimming, cycling, etc), which give stress on cardiovascular and respiratory system, are very popular. On the other hand, ancient yogic exercises which have been claimed to have a holistic approach towards good health is getting popularity all over the world (Ross & Thomas 2010). Further, cardiovascular endurance is considered the most important component of health-related fitness because the functioning of the heart and lungs is so essential to overall wellness. A person simply cannot live very long or very well without a healthy heart. Low levels of cardiorespiratory fitness are linked with heart disease, the leading cause of

death. Therefore, the focus of the present study is to see the effect of yoga as well as weight training on cardiovascular endurance and motor fitness among college students.

Statement of the Problem

Physical fitness is an important aspect of human functionality related to health and well being. Fitness is characterized by a person's capability to function in and adapt to physical exercise and can be demonstrated through the operation of body systems associated with energy supply and energy transmission, circulation and respiration and the performance of muscles and other soft tissues (Huotari, Saakslahtiand & Watt 2009; Mikkelsson *et al.*, 2005). A good status of physical fitness is achieved by regular practice of physical exercises. Despite the well known benefits of physical exercise, most adults and children lead relatively sedentary lifestyles. They are not active enough. Earlier studies revealed that participation to physical activities is rapidly decreased especially in the periods of high school and university education (Gyurcsik *et al.*, 2004; Kwak *et al.*, 2009; Sinclair *et al.* 2005). Further, cardiorespiratory fitness levels among young people have been found to be steeply declined (Tomkinson & Oliver, 2007). In fact, physical fitness is a multi-dimensional construct that includes skill- and health-related components of which cardio respiratory fitness (CRF) and muscular fitness, in particular, are powerful determinants of health in youth (Ortega *et al.,* 2008). Substantial evidence indicates that children's physical fitness levels are markers of their lifestyles and cardio -metabolic health profiles and also a predictor of the future risk of chronic diseases (Ekelund *et al.,* 2007; Eisenmann, 2007). There are a number of cross-sectional studies and systematic reviews showing that low CFR young people is independently associated with a higher metabolic risk score (Eisenmann, 2007). Musculoskeletal component is inversely associated with metabolic risk and is also a valuable indicator to monitor health in adults (Steene-Johannessen *et al.,* 2009).

It is evident from the previous studies that the physical activity is declining in college students in particular and, indicates risk factors for developing various metabolic disorders. Therefore, there is need to develop a exercise program which will be effective in improving health related physical fitness of college students. In fact, there are very few research reports comparing the effect of yoga practices and weight training on cardiovascular endurance and motor fitness among college students. Hence, this study entitled ***"Effect of yogic practices and weight training exercises on cardiovascular endurance and motor fitness of male college students of Satara District: A comparative study***" seems to be logical and justified.

Problem and its Relevance

In the recent decade, a decline in physical activity among college students has been evidenced (Sacheck *et al.*, 2010). Regular physical activity is an important part of a healthy lifestyle. It is associated with decreased risk of heart disease, obesity, and related to psychological well-being with lower levels of stress and better cognitive functioning (Shaw *et al.*, 2004; Coyle 2009; Pertruzelo *et al.*, 1991; Crews and Landers 1987; Etnier *et al.*, 1997). Recent studies indicate that college student population does not participate in moderate or vigorous physical activity. There is an alarming decline in physical activity among college students compared with those in high school (Bray and Born 2004). In addition there have been several publications in recent years reporting on the quantity of physical activity performed by college students.

In fact, overweight in children and adolescents are increasingly common (Ogden *et al.*, 2002) while physical fitness in adolescents is declining (Malina 2007). Lower fitness in adolescents may track into adulthood. Kann *et al.,* (1996) showed that adolescence appears to be a period characterized by marked declines in physical activity. Changes occurring during adolescence include positive and negative habits regarding health, which are acquired

before adulthood (Trudeau *et al.,* 1999). In subsequent studies, numerous researchers have shown that the rate of children and adolescents developing physical activity has decreased over the last few years due to the increasing influence of sedentary activities such as television viewing, internet surfing and video games (Berkey *et al.,* 2000; Boreham & Riddoch, 2001). In support of this trend, Gordon-Larsen *et al.,* (2000) found that adolescents spend less time in PE sessions than younger children. These findings reinforce the need for physical activity intervention programmes for children and adolescents. It has been evident that a well-designed physical education program can motivate students to maintain healthy habits and regular physical activity (Beets & Pitetti, 2005). It is also effective in enhancing students' physical activity-related knowledge (Hayman *et al.,* 2004), attitude, behaviours, and physical fitness (Kohl, 2001).

Nevertheless, it has been established that physical activity does not only positively influence physiological factors, but has also a positive effect on psychological aspects. Regular physical activity can increase the ability to cope with stress and leads to an improved health perception and quality of life. Yoga is an alternative form of physical activity which may assist in achieving recommended levels of physical activity for some individuals. Yoga is increasing in popularity and may be attractive as an alternative to traditional aerobic and strength training programs because it requires little space, virtually no equipment, has limited harmful side effects (Raub 2002; Labarthe and Ayala 2002; Gimble 1998). Yogic exercises are focused on relaxation, body awareness, and meditation which provide a qualitatively different exercise experience.

Although yoga has received a considerable amount of study to date demonstrating significant cardio-respiratory (Joseph *et al.,* 1981; Innes et al., 2005), musculoskeletal and metabolic health benefits (Tran *et al.,* 2001), the degree to which yoga may have contributed to enhance cardiovascular endurance and motor fitness in adolescents has not been explored. Further,

weight training exercises showed multiple physiological benefits for youth which may provide enjoyment and positive attitude toward lifetime physical activity and may promote adherence to regular exercise among children and adolescents (Sothern et al., 1999; Hunter, Bamman & Hester 2000). Hence the researcher has undertaken this study to see the effect of yogic practices and weight training exercises on cardiovascular endurance and motor fitness of college students.

Objectives of the Study

This study is planned to see the efficacy of yoga practices and weight training on cardiovascular endurance and motor function of college students in Satara District. To accomplish the purpose, following objectives have been considered:

1. To assess the cardiovascular and motor function of college students.

2. To prepare training program of yogic practices and weight training for college students for enhancing cardiovascular endurance and motor function.

3. To study the effect of yogic exercises and its impact on respiratory and cardiovascular function of college students through a controlled experiment.

4. To suggest inclusion of specific yogic practice in the college curriculum, if there is improvement in overall cardio – respiratory functions of the college students.

5. To assess the effect of weight training on cardio – vascular function of the college students.

6. To compare the overall impact of yogic practices and weight training.

7. To study the effect of yoga training, weight training exercise and their combined intervention on cardiovascular endurance and motor function of the college students.

Hypotheses

On the basis of ample of research evidence available so far, the researcher has formulated the following hypotheses:

H1: The yogic practice training may be effective in improving cardiovascular endurance and motor function of college students.

H2: The weight training may be effective in improving cardiovascular endurance and motor function of college students.

H3: A combination of yogic practice and weight trainings exercise will be more effective than the individual one.

Delimitation of the Study

The present study will be delimited as follows:

- This study will be delimited to college male students, aged between 18 – 22 years from Raja Shripatrao Bahgwantrao Mahavidyalaya, Aundh Satara

- This study will be delimited to a schedule consisting of yogic asanas and pranayama.

- This study is delimited to light weight training exercises.

- Although various yogic practices such as pranayama, yoga asanas etc. Are generally known for the improvement of overall respiratory function; however the selected Pranayama as mentioned in yoga texts have been developed especially to evaluate for the college students.

Limitations of the Study

- This study will not include various colleges located in Satara district due to time constraint and paucity of fund for data collection.

- The training programme schedule will be implemented simultaneously through properly trained teachers. Hence, the capacities of different teachers may differ and hence if forms a limitation in this study.

- Since, there will not be a direct control of the investigator over all subjects especially about their daily diet, food habit, rest, daily routines etc. So these facts will form another limitation in this study.

Significance of the Study

This study is significant in the following ways:

- The yoga practices as selected in this study may have immense importance for improvement in health related physical fitness and motor function of college students.

- Yoga practices, as developed in this study, may remove obstacles and may promote personality and health related physical fitness of college students.

- Physical education teachers may get a ready-made yoga and weight training module as a strategic training intervention for enhancing physical fitness and motor function.

- Selected yoga module may be incorporated in the curriculum of physical education with a view to improve all round development among college students.

- The study will help adolescents for better understanding effect of yoga practices and weight training exercise.

- The result of the study will add further knowledge to existing literature of health related physical fitness and motor function in relation to yoga practices and weight training.

Operational Definitions of Terms Used

Cardio Vascular efficiency

It is the ability to continue or persist in strenuous tasks involving large muscle groups for extended periods of time. It is the ability of the circulatory and respiratory to adjust to and recover from the effects of whole body exercise or work.

The relationship between *Cardiorepiratory fitness* and *health* is well documented increases in CRF permit a higher quality of life by increasing the rate at which energy can be provided to support work and play activities.

Motor fitness

The neuromuscular components of fitness, which enable a person to perform successfully at a particular motor skill, game, or activity. Specific motor fitness components include Agility, Balance, Coordination, Power, Reaction – Time, and Speed. Motor fitness is sometimes referred to as skill – related fitness.

Yogic practices

Yoga practices are the components of Yoga such as *asanas, pranayamas, kriyas, meditation, om chanting etc.,* as described in Patanjala

Yoga and Hatha yoga. Asanas are understood as posture. Pranayamas are known as controlled breathing, kriyas are called as cleansing process, and Om chanting is the recitation of the word “AUM” as per yoga tradition.

Weight Training

Weight training is a common type of strength training for developing the strength and size of skeletal muscles. It uses the weight force of gravity (in the form of weighted bars, dumbbells or weight stacks) to oppose the force generated by muscle through concentric or eccentric contraction. Weight training uses a variety of specialized equipment to target specific muscle groups and types of movement. Weight training differs from Bodybuilding, Weight – Lifting, Power Lifting, etc., which are sports rather that form of exercise. Weight training, however, is often part of the athlete’s training regimen.

BRIEF REVIEW OF LITERATURE

The researcher has gone through various electronic databases to locate the research studies related to present topic which are presented here as follows:

Manual resistance training (MRT), an alternative to traditional resistance training, requires minimal equipment and may be effective when applied in school-based physical education (PE) classes. The purpose of this study conducted by Dorgo (2009) was to document the physical changes in adolescents (n = 222) using MRT in school-based PE settings. Six fitness tests from the Fitnessgram assessment tool were selected to assess students' cardiovascular and muscular fitness, and skinfold tests were used to assess body composition. One control and 2 experimental groups were defined. The control group of students (n = 129) attended regular PE classes. One experimental group (n = 63) attended PE that was complemented by the MRT system. A second experimental group (n = 30) attended PE complemented by

MRT and cardiovascular endurance training. With use of the selected Fitnessgram tests, post-test measurements were performed after 9 and 18 weeks of PE. At baseline, there were no significant differences among the 3 groups for most measures. Compared with baseline, the experimental groups improved significantly in all 6 fitness measures and showed more improvements than the control group in most fitness measures both at 9 and 18 weeks. None of the groups showed significant improvement in body composition. The results documented that an MRT-complemented PE program was effective in improving adolescents' muscular fitness. An 18-week combined MRT and cardiovascular endurance training program effectively improved cardiovascular and muscular fitness but was ineffective in improving adolescent body composition. An MRT-based exercise session requires minimal equipment and set-up and can be performed in a short period of time, and therefore it is suitable for application in regular PE settings.

Dorgo, King and Rice (2009) investigated the effects of a manual resistance training (MRT) program on muscular strength and endurance and to compared these effects with those of an identically structured weight resistance training (WRT) program. To do this, 84 healthy college students were randomly assigned to either an MRT (n = 53, mean +/- SD: age 25.6 +/- 6.0 years, height 170.1 +/- 8.1 cm, body mass 73.9 +/- 16.0 kg, and body fat 24.6 +/- 8.7%) or WRT (n = 31, mean +/- SD: age 25.5 +/- 5.2 years; height 169.6 +/- 10.1 cm, body mass 75.0 +/- 17.4 kg, and body fat 24.7 +/- 8.5%) group and engaged in a 14-week training program. Each participant's performance was assessed before and immediately after the 14-week training period. Muscular strength was assessed by the one-repetition maximum (1RM) bench press test and the 1RM squat test. Muscular endurance was recorded as the maximum number of repetitions performed with 70% of pretraining 1RM for the bench press and squat exercises. There were no significant differences between the MRT and WRT groups at baseline for muscular strength ($p > 0.36$) or muscular endurance ($p > 0.46$). Compared with baseline values, the 14-week training programs produced significant ($p <$

0.001) improvements in muscular strength and muscular endurance of the MRT and WRT groups. However, no significant difference was observed between the MRT and WRT groups for muscular strength ($p > 0.22$) or for muscular endurance ($p > 0.09$) after training. The improvements in muscular strength and muscular endurance after a 14-week MRT program in the present study were similar to those produced by a WRT program, and well-designed MRT exercises seem to be effective for improving muscular fitness.

Physical fitness level is a marker of cardiovascular health in young people. The aim of this study conducted by Ardoy et al., (2011) was to analyze the effects of a school-based intervention program, focused on increasing the volume and intensity of physical education (PE) sessions, on adolescents' physical fitness. Sixty-seven adolescents (12-14 years old) from three secondary school classes participated in a 16-week intervention. The classes were randomly allocated to the control group, experimental group 1 (EG1) or experimental group 2 (EG2). The control group received standard PE (2 sessions/week), the EG1 received 4 standard PE sessions/week and the EG2 received four high-intensity PE sessions/week. Aerobic fitness, muscle strength, speed-agility and flexibility were assessed using previously validated field-based tests before and after the intervention. Doubling the number of PE sessions/week resulted in improvements in aerobic fitness and flexibility ($P=.008$ and $P=.04$, respectively). Further increases in the intensity of the sessions were related to improvements in speed-agility ($P<.001$). The maximal oxygen consumption increased by 3 and 5 mL/kg/min in the EG1 and EG2, respectively. No differences were observed for muscle strength. The results suggest that doubling the frequency of PE sessions is a sufficient stimulus to improve physical fitness, particularly aerobic fitness, which has been shown to be a powerful indicator of cardiovascular health in children and adolescents. Future studies involving larger sample sizes should confirm or refute these findings.

Jarani et al., (2016) evaluated the effectiveness of two school-based physical education (PE) programmes (exercise-based and games-based) compared with traditional PE, on health- and skill-related physical fitness components in children in Tirana, Albania. Participants were 378 first-grade (6.8 years) and 389 fourth-grade (9.8 years) children attending four randomly selected schools in Tirana. Twenty-four school classes within these schools were randomly selected (stratified by school and school grade) to participate as exercise group (EG), games group (GG) and control group (CG). Both EG and GG intervention programmes were taught by professional PE teachers using station/circuit teaching framework while CG referred to traditional PE school lessons by a general teacher. All programmes ran in parallel and lasted 5 months, having the same frequency (twice weekly) and duration (45 min). Heart rate (HR) monitoring showed that intensity during PE lessons was significantly higher in the intervention groups compared with control ($P < 0.001$). Both PE exercise- and games programmes significantly improved several health- and skill-related fitness indicators compared with traditional PE lessons (e.g. gross motor skill summary score: 9.4 (95% CI 7.9; 10.9) for exercise vs. control and 6.5 (95% CI 5.1; 8.1) for games vs. control, cardiorespiratory fitness: 2.0 ml O2 · min(-1) · kg(-1) (95% CI 1.5; 2.4) for exercise vs. control and 1.4 ml O2 · min(-1) · kg(-1) (95% CI 1.0; 1.8) for games vs. control). Furthermore, compared to games-based PE, exercise-based PE showed more positive changes in some gross motor coordination skills outcomes, coordination skills outcomes and cardiorespiratory fitness. The results from this study show that exercise- and games-based PE represents a useful strategy for improving health- and skill-related physical fitness in Albanian elementary school children. In addition, the study shows that exercise-based PE was more effective than games-based PE in improving gross motor function and cardiorespiratory fitness.

Eather, Morgan and Lubans (2015) evaluated the preliminary efficacy and feasibility of the CrossFit Teens™ resistance training programme for improving health-related fitness and resistance training skill competency in

adolescents. This assessor-blinded randomized controlled trial was conducted in one secondary school in the Hunter Region, Australia, from July to September 2013. Ninety-six (96) students (age = 15.4 (.5) years, 51.5% female) were randomized into intervention (n = 51) or control (n = 45) conditions for 8-weeks (60 min twice per week). Waist circumference, body mass index (BMI), BMI-Z score (primary outcomes), cardiorespiratory fitness (shuttle run test), muscular fitness (standing jump, push-up, handgrip, curl-up test), flexibility (sit and reach) and resistance training skill competency were measured at baseline and immediate post-intervention. Feasibility measures of recruitment, retention, adherence and satisfaction were assessed. Significant group-by-time intervention effects were found for waist circumference [-3.1 cm, P < 0.001], BMI [-1.38 kg · m(–)(2), P < 0.001], BMI-Z [-0.5 z-scores, P < 0.001], sit and reach [+3.0 cm, P < 0.001], standing jump [+0.1 m, P = 0.021] and shuttle run [+10.3 laps, P = 0.019]. Retention rate was 82.3%. All programme sessions were delivered and participants' mean satisfaction scores ranged from 4.2 to 4.6 out of 5. The findings demonstrate that CrossFit Teens™ is a feasible and efficacious programme for improving health-related fitness in adolescents.

Madanmohan *et al.,* (2004) reported the effects of yoga training on cardiovascular response to exercise and the time course of recovery after the exercise. Cardiovascular response to exercise was determined by Harvard step test using a platform of 45 cm height. The subjects were asked to step up and down the platform at a rate of 30/min for a total duration of 5 min or until fatigue, whichever was earlier. Heart rate (HR) and blood pressure response to exercise were measured in supine position before exercise and at 1, 2, 3, 4, 5, 7 and 10 minutes after the exercise. Rate-pressure product [RPP = (HR x SP)/100] and double product (Do P = HR x MP), which are indices of work done by the heart were also calculated. Exercise produced a significant increase in HR, systolic pressure, RPP & DoP and a significant decrease in diastolic pressure. After two months of yoga training, exercise-induced changes in these parameters were significantly reduced. It is concluded that

after yoga training a given level of exercise leads to a milder cardiovascular response, suggesting better exercise tolerance.

Telles *et al.,* (1993) assessed two groups of 45 children each, whose ages ranged from 9 to 13 years, on a steadiness test, at the beginning and again at the end of a 10-day period during which one group received training in yoga, while the other group did not. The steadiness test required insertion of and holding for 15 sec. a metal stylus without touching the sides of holes of decreasing sizes in a metal plate. The contacts were counted as 'errors'. During the 10-day period, one group (the 'Yoga' group) received training in special physical postures (asanas), voluntary regulation of breathing (Pranayama), maintenance of silence, as well as visual focussing exercises (tratakas) and games to improve the attention span and memory. The other group (control) carried out their usual routine. After 10 days, the 'Yoga' group showed a significant (Wilcoxon's paired signed-ranks test) decrease in errors, whereas the 'control' group showed no change.

Tran *et al.,* (2001) studied ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% ($p<0.05$), respectively, whereas isometric muscular endurance for knee flexion increased 57% ($p<0.01$). Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% ($p<0.01$), 155% ($p<0.001$), 188%

($p<0.001$), and 14% ($p<0.05$), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively ($p<0.01$). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness.

The literature presented above indicates the availability of ample of researches on the effect of various exercise and yoga training programmes on physical, anthropological and physiological attributes of health and fitness. However, there are very few studies exploring effect of yoga and weight training program on cardiovascular endurance and motor function among college students. Therefore, this study seems to logical and justified.

METHODOLOGY

The present study is planned with a view to study the effect of yogic practices and weight training exercises on cardiovascular endurance and motor fitness level of college male students of Satara district. The methodology to follow this experiment will be as follows:

Sample

To achieve the purpose of this study, a total of one hundred male college students (n=100), aged 18-22 years, from Raja Shirpatrao Bhagwantrao Mahavidyalaya, Aundh, Satara will be selected randomly. Making the use of table random numbers all the 100 subjects will be divided randomly into four equal groups as follows:

Group 'A' (n=25) Yogic training group

Group' B' (n=25) Weight training group

Group 'C' (n=25) Yogic training and weight training Mixed group

Group 'D' (n=25) Control group

Training Schedule

A schedule of yogic practices will be prepared in consultation with expert and then it will be implemented over the students of Group 'A' for three days a week (i.e. on Monday, Wednesday and Friday) for a total period of 16 weeks.

Similarly a schedule of weight training exercises will be prepared and implemented over the students of Group 'B' for three days (i.e. on Tuesday, Thursday and Saturday) for over a total period of 16 weeks.

Both these yogic and weight training scheduled prepared above will be implemented on alternate days on the subjects of Group 'C' for six days of the week (i,e, on all days) for a period of 16 weeks.

The control group 'D' will not be given any of the above specified type of trainings. The training for all above groups A to D will be conducted for total periods 16 weeks. Yogic practices training program thrice a week.

1) Training schedule during 1st and 2nd weeks:

Day	Asanas	Pranayama	Shawasan	Rest after each set
Tue	30 Min.	20 Min.	5 Min.	2 Min.
Thu	30 Min.	20 Min.	5 Min.	2 Min.
Sat	30 Min.	20 Min.	5 Min.	2 Min.

2) Training schedule during 3rd and 4th weeks:

Day	Asanas	Pranayama	Shawasan	Rest after each set
Tue	30 Min.	20 Min.	5 Min.	2 Min.
Thu	30 Min.	20 Min.	5 Min.	2 Min.
Sat	30 Min.	20 Min.	5 Min.	2 Min.

3) Training schedule during 5th and 8th weeks

Day	Asanas	Pranayama	Shawasan	Rest after each set
Tue	30 Min.	20 Min.	5 Min.	2 Min.
Thu	30 Min.	20 Min.	5 Min.	2 Min.
Sat	30 Min.	20 Min.	5 Min.	2 Min.

4) Training schedule during 9th and 12th weeks

Day	Asanas	Pranayama	Shawasan	Rest after each set
Tue	30 Min.	20 Min.	5 Min.	2 Min.
Thu	30 Min.	20 Min.	5 Min.	2 Min.
Sat	30 Min.	20 Min.	5 Min.	2 Min.

5) Training schedule during 13th to 16th weeks

Day	Asanas	Pranayama	Shawasan	Rest after each set
Tue	30 Min.	20 Min.	5 Min.	2 Min.
Thu	30 Min.	20 Min.	5 Min.	2 Min.
Sat	30 Min.	20 Min.	5 Min.	2 Min.

Note: Details of Yogic Practices such as Asanas, Prayamas and kriyas will be decided later with consultation with Guide and Experts in Yoga.

I. Schedule of Weight Training Exercises

1) Training schedule during 1st and 2nd weeks

Day	Weight X Set	Period of Repetitions	Rest In between	Rest after each set
Tue	20 Kg.X3	10 Min.	2 Min.	4 Min.
Thu	20 Kg.X3	10 Min.	2 Min.	4 Min.
Sat	20 Kg.X3	10 Min.	2 Min.	4 Min.

2) Training schedule during 3rd and 4th weeks

Day	Weight X Set	Period of Repetitions	Rest In between	Rest after each set
Tue	25 Kg.X3	10 Min.	2 Min.	4 Min.
Thu	25 Kg.X3	10 Min.	2 Min.	4 Min.
Sat	30 Kg.X3	10 Min.	2 Min.	4 Min.

3) Training schedule during 1st and 2nd weeks

Day	Weight X Set	Period of Repetitions	Rest In between	Rest after each set
Tue	30 Kg.X3	15 Min.	2 Min.	4 Min.
Thu	35 Kg.X3	15 Min.	2 Min.	4 Min.
Sat	35 Kg.X3	15 Min.	2 Min.	4 Min.

4) Training schedule during 9th to 12th weeks

Day	Weight X Set	Period of Repetitions	Rest In between	Rest after each set
Tue	35 Kg.X3	15 Min.	2 Min.	4 Min.
Thu	35 Kg.X3	15 Min.	2 Min.	4 Min.
Sat	40 Kg.X3	15 Min.	2 Min.	4 Min.

5) Training schedule during 13th to 16th weeks

Day	Weight X Set	Period of Repetitions	Rest In between	Rest after each set
Tue	35 Kg.X3	20 Min.	2 Min.	4 Min.
Thu	35 Kg.X3	20 Min.	2 Min.	4 Min.
Sat	40 Kg.X3	20 Min.	2 Min.	4 Min.

Details of weight training exercises will be decided in due course of time with consultation with guide and expert in weight training .

Research Design

- Group-A i.e. experimental group will undergo a Yoga training program and will participate in college routine.
- Group-B i.e. experimental group will undergo a Weight training exercise program and will participate in college routine.
- Group-C i.e. experimental group will undergo a training program on *selected yoga practices plus weight training exercises and has to attend college routine*.
- Group-D i.e. control group has to participated in recreational activities and college routine.

The experiment will be conducted in three phases:

- Pre Test;
- Treatment / Training, and
- Post Test.

Phase - I: Pre – Test

Since this study intends to study the effect of yogic practices and weight training exercises over lungs and cardiovascular efficiency and physical fitness among college students. All the subjects of experimental and control groups will be exposed to standard tests to record cardiovascular endurance and motor fitness level specifically Speed, Endurance, Flexibility, Agility and Reaction time through specific AAPHER Test.

Phase - II: Treatment stimulus

After the pre test is over, all the subjects of experimental group "A" and "B" will be exposed to sixteen weeks training of yogic practices

and weight training exercises respectively and students from Group "C" will receive both yogic practices and weight training for 2 hours daily i.e. except Sundays and holidays . The subjects of control group will neither receive above mentioned yogic practice nor weight training, however, they will be kept busy with some recreational activities for 2 hours daily (1 hour in the morning and 1 hour in the evening). The subjects of experimental groups will be given training on yoga and weight Training for total period of 16 weeks.

For the total period of sixteen weeks one yoga teacher will be appointed to organize daily training programmes (yogasanas followed by some pranayama) in the morning at 7:15 to 8:15 am and 5:15 to 7:15 pm in the overall supervision of the present investigator. Similarly a Gym Trainer will be appointed to conduct the practice of Weight Training for the groups concerned.

Phase - III: Post - Test

Finally , when the treatment or training period of sixteen weeks will be over, the post -test namely AAPHER and Harvard step test will be conducted over all the subject of four groups like the pre test, for measuring cardiovascular endurance and motor fitness level respectively .

Variable & Tools to be Used

Before and after the experiment following variables on the entire subject will be assessed with the help of some standard test items :

Variable	Tools/ Method Used
Lungs Capacity	Wright's Peak Flow Meter
Cardiovascular Endurance	Harvard Step Test
Motor Fitness Level	AAPHER

Ethical Consideration

Prior to the experiment, informed consent of all the participants will be taken with standard format (as per the Declaration of Helsinki). Accordingly, permission from the Principal of the college will also be taken before commencement of the experiment.

Statistical Techniques to be used

Primarily the data will be analyzed using descriptive statistics. Further, they will be processed through inferential statistics i.e., ANCOVA followed by Scheffe's post hoc test.

Facilities Required

- **Instruments:** Available.
- **Man Power:**
    - The experts required for training in yoga and weight training exercise will be made available. Further, the man power for data collection will be deputed as required.

CHAPTERIZATION

The report of the thesis will be written in five chapters viz.,

1. Introduction,
2. Review of related literature,
3. Methodology,
4. Analysis and interpretation of Results, and
5. Summary, conclusion and recommendations.

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RESEARCH GUIDE

Schedule for Completion of Research Work

Month and Year	Work to be completed
May-August 2016	o Completion of draft project proposal o Finalization of project proposal in consultation with guide. o Presentation of research proposal. o Modifications in proposal if suggested.
September-December 2016	o Identification and permission from college. o Summarization of purpose of project to the principal and management of college. o To acquire consent from college. o To fix the suitable dates for experiment.
January 2017-March 2017	o Communication and Procurement of instruments needed for the experiment. o Standardization and get acquainted with the use of instruments. o Selection of and randomization of subjects for experiment.
April-July 2017	o Pre test o Training intervention o Post test.
July-October 2017	o Review of literature o Acquisition of data o Writing of introduction
November 2017-January 2018	o Sorting of Data o Analysis of data
February – May 2018	o Completion of first draft of thesis o Correction of thesis in consultation with research guide o Preparation of synopsis
June-July 2018	o Submission and presentation of synopsis o Pre viva
August-September 2018	o Finalization of thesis o Submission of thesis